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Alaska-Cedar

An American Wood

Alaska-cedar, one of the most durable of American woods, has a fine, even texture; straight grain; and clear yellow color. It is used wherever durability, acid resistance, stability, smooth-wearing qualities, and workability are needed. Production has been low in the past, largely because the species is scattered and the cost of logging is high. Availability is increasing, however, as logging for other species progresses to poorer sites and higher elevations. Much of the lumber and most logs are now exported to Japan. Domestic use is expanding with efforts to market lower grades of Alaska-cedar lumber.

F-521066

Alaska-Cedar

(Chamaecyparis nootkatensis (D. Don) Spach)

A.S. Harris[1]

Distribution

The natural range of Alaska-cedar extends from northern California to Prince William Sound, Alaska (fig. 1). Except for a few isolated stands, it is found within 150 miles of the Pacific coast. Isolated stands at Mount Emily and Mount Grayback in Siskiyou County, Calif., near the Oregon border mark its southern limit. In Oregon and Washington, Alaska-cedar occurs in the Cascade Range and Olympic Mountains, and scattered populations are found in the Coast Ranges and in the Aldrich Mountains of central Oregon. In British Columbia and north to Wells Bay in Prince William Sound, Alaska, it grows on the islands and in a narrow strip along the coastal mainland. An exception in British Columbia is an isolated stand near Slocan Lake about 450 miles inland.

Alaska-cedar grows at elevations of 2,000 to 7,500 feet in the Cascade Range in Oregon and Washington and occasionally down to sea level on the Olympic Peninsula and the west coast of Vancouver Island. On the southern British Columbia mainland, it usually occurs between 2,000 and 5,000 feet, but grows at gradually lower elevation as the range reaches northward and is found at sea level at Knight Inlet. From there, north and west to Prince William Sound in Alaska, it is found from sea level to tree line, which varies from 3,000 feet in southeast Alaska to 1,000 feet near Prince William Sound.

Alaska-cedar occasionally grows in pure stands but usually singly or in scattered groups mixed with other tree species which change with latitude. Alaska-cedar may be found with the

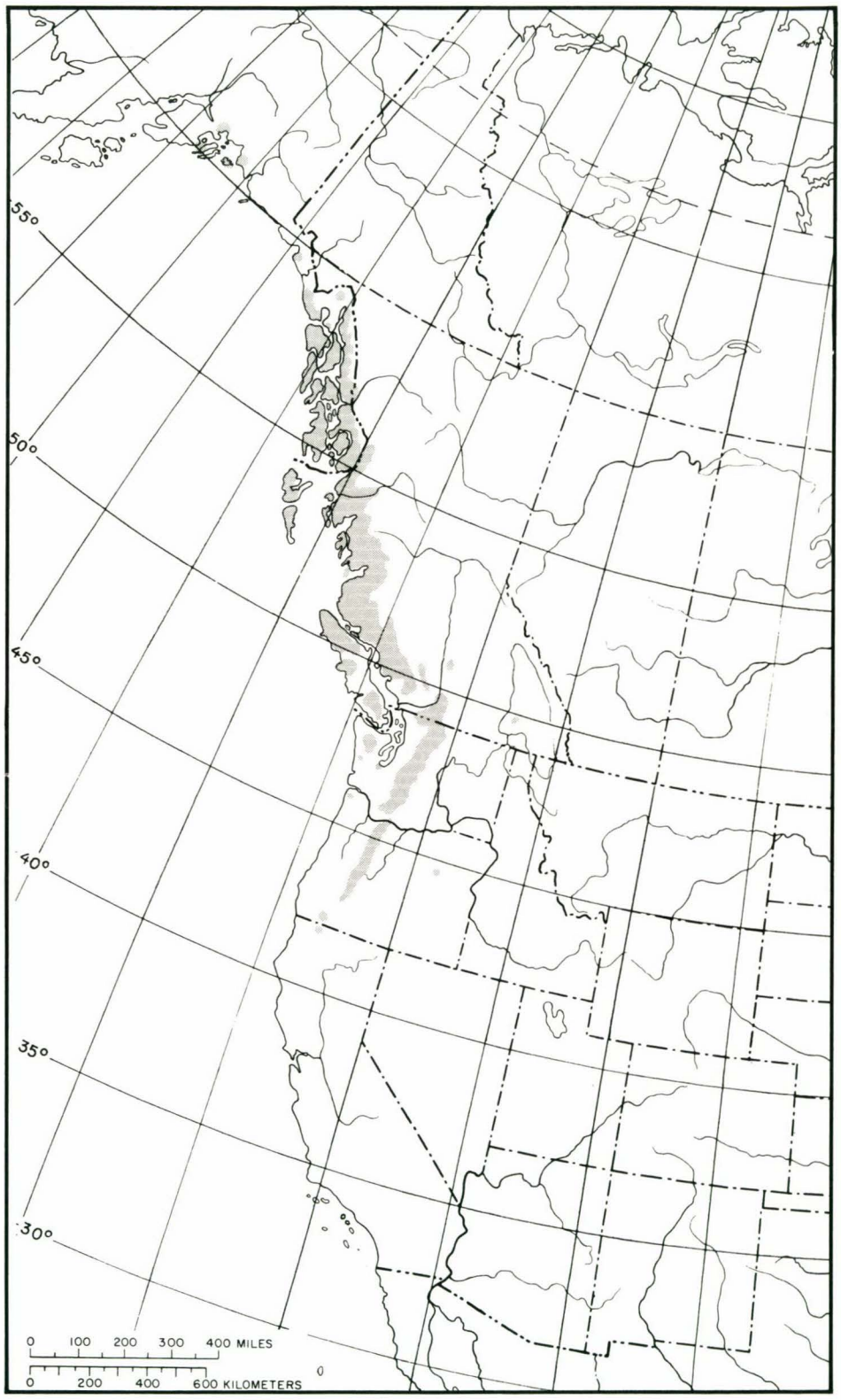

Figure 1—The natural range of Alaska-cedar. **F-532738**

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following species within their respective ranges:

Common name	Scientific name
Shasta fir	*Abies magnifica*
Brewer spruce	*Picea brewerana*
Incense-cedar	*Libocedrus decurrens*
Pacific yew	*Taxus brevifolia*
Western white pine	*Pinus monticola*
Mountain hemlock	*Tsuga mertensiana*
Subalpine fir	*Abies lasiocarpa*
Whitebark pine	*Pinus albicaulis*
Pacific silver fir	*Abies amabilis*
Noble fir	*Abies procera*
Western hemlock	*Tsuga heterophylla*
Western redcedar	*Thuja plicata*
Shore pine	*Pinus contorta* var. *contorta*
Sitka spruce	*Picea sitchensis*

Alaska-cedar is confined to areas with a cool, humid climate. The growing season is short, but winters are not exceptionally severe. Snowfall is heavy over much of its range. The tree grows on a variety of soils. It grows and develops best on deep, well-drained soils, but is seldom found on the better sites because of competition from faster growing associates. More frequently it occurs on thin organic soils over bedrock, and it survives and grows on soils that are deficient in nutrients. Alaska-cedar is common in "scrub" stands on organic soils at low and subalpine elevations in Alaska.

Description and Growth

Alaska-cedar is slow growing and long lived. Growth rates of 80 rings per inch are not uncommon, and rates of 360 rings per inch have been noted. Slow growth, coupled with durability of the wood, gives the tree great longevity. In Alaska, many suppressed trees 2 to 6 inches in diameter are more than 300 years old; many dominant and codominant trees 24 to 36 inches in diameter are more than 700 years old. Extremely old trees have been reported; one hollow tree 70 inches in diameter had 1,040 growth rings in the 12-inch outer shell.

Growth is especially slow at timberline, and trees may resemble sprawling shrubs. Roots may reach out as far as 100 feet, much of the distance at the surface. Sprouting from roots and rooting of buried branches are common. The tree survives heavy loads of snow because of its narrow, flexible crown and drooping branches. Its supple form helps it survive on avalanche tracks.

Figure 2—Bark of Alaska-cedar. F-302877

In Washington, the dominant trees on better sites are usually 100 to 125 feet tall; in British Columbia, they are 36 inches in diameter and 75 to 100 feet tall; and in Alaska, dominant trees are often 24 inches in diameter and 80 feet tall, although larger trees are common. The largest specimen on record is in Olympic National Park, Wash. It is 12 feet in diameter, 120 feet tall, and has a 27-foot crown spread.

Trunks may be fluted and swollen at the base and taper sharply where growth is especially slow. Many trees lean slightly. The bark on old trees is one-half to three-fourths of an inch thick, brown or gray on the outside, and cinnamon brown inside. The bark surface is irregularly broken by shallow, vertical seams, between which the bark separates and curls into narrow flakes (fig. 2). Flaking of bark is pronounced on the protected sides of slightly leaning trees, but on the unprotected sides bark is usually weathered to a fibrous, matted condition.

The small, scalelike leaves are pressed closely to twigs in an overlapping pattern of four rows, giving a squarish cross section to the branchlets. Leaves are dull blue- or gray green, and have sharp, prickly, spreading points. Branchlets hang down from heavy branches in flattened, fernlike sprays, giving the tree a weeping appearance. The crown is narrow and conical; in some trees it looks ragged because the branchlets are widely separated. When trees are small, the leaders are slender and whiplike.

Flowering occurs from April in the southern part of the range to June in

the north. In Alaska, seeds ripen in mid-September and are shed during dry periods in the fall and early winter. Empty cones may remain on trees for several years.

Mature cones are about one-half of an inch in diameter, globe shaped, and have small spikes jutting out from the shield-shaped scales (fig. 3). The cones are light green when immature but change gradually to yellow brown and brown as they mature. Cones usually develop in 2 years, but in the southern part of the range they are likely to mature in 1 year. Both first- and second-year cones may occur on the same branch.

Figure 3—Foliage and cones of Alaska-cedar. F-521065

Common Names

Alaska-cedar is the preferred common name in the United States; yellow-cedar is the common name preferred in Canada. Recent Canadian trade names are Pacific coast cypress and Pacific coast yellow-cedar. Other common names are Alaska yellow-cedar, yellow cypress, Nootka false-cypress and Nootka cypress.

Related Commercial Species

Related species in the United States are Port-Orford-cedar *(Chamaecyparis lawsoniana)* and Atlantic white cedar *(Chamaecyparis thyoides)*. The three American species are quite similar in appearance, and their woods are so closely related that they can be distinguished only by microscopic examination.

Supply

In the late 1970's, estimates place the total volume of Alaska-cedar sawtimber at 29.6 billion board feet. About 72 percent of this volume is in British Columbia, 21 percent in Alaska, and 7 percent in Washington and Oregon.

Because trees are often scattered and at high elevations, much of the timber is inaccessible. But as logging moves to higher elevations and poorer sites, more Alaska-cedar timber is becoming available. There is little reliable information on the amount accessible now.

Production

Long-term production statistics are not available because in many reports the cut of Alaska-cedar has been combined with that of western redcedar and other softwoods. Production has been limited and the supply erratic over the years. In the past, only selected trees in the better stands were logged; now, much of the harvest results from clearcutting mixed stands for pulpwood. As lower grade logs are produced, marketing practices are changing and uses are being developed for lower quality lumber.

Only a small amount of Alaska-cedar now finds its way into domestic markets in the United States and Canada. Most of the annual cut is exported, chiefly to Japan, in the form of cants (squared-off timbers) and logs.

Characteristics and Properties

The wood of Alaska-cedar resembles that of Port-Orford-cedar and Atlantic white cedar in appearance and properties. The heartwood is a bright, clear, sulfur yellow. The sapwood is narrow, usually lighter in color, and is often difficult to distinguish from heartwood. Annual growth rings are faintly visible in flat-grained lumber or rotary-cut veneer and are virtually absent in vertical-grained lumber. The wood has fine texture and straight grain. It is classed as moderately heavy and is moderate in strength, stiffness, hardness, and shock resistance. The average specific gravity is 0.42, based on oven-dry weight and green volume. Average

air-dry weight at 12-percent moisture content is about 30 pounds per cubic foot.

The wood has a high oil content and is strongly aromatic. The odor has been described as resembling raw potatoes or turnips and serves to identify Alaska-cedar at once. Because of the high oil content, electrical moisture meters may fail to give true values without special calibration. Some people suffer allergic reactions to the foliage or freshly cut wood.

Unlike most softwoods, the wood shows no marked difference between earlywood and latewood. This gives the wood a uniform texture and makes it ideal for carving, veneers, joinery, and any product where smooth wear is desirable. It works well by hand or machine tools and has a slightly dulling effect on cutting edges. The wood takes a smooth finish, but where the grain is wavy there is a slight tendency toward roughness after planing. Nail-holding power is not as good as in other woods of equal density but improves as the wood ages.

Alaska-cedar glues well under controlled conditions, more easily with resin glues than with nonresin glues. Some users recommend washing surfaces with heated turpentine before gluing. Tests have shown that although Alaska-cedar laminated with resorcinol-phenolformaldehyde glues delaminates more readily than other woods of similar densities, it will stand up satisfactorily under weather tests for at least 18 months. Laminated Alaska-cedar is acceptable for marine use.

Alaska-cedar seasons readily, and 1-inch and 1-1/2 inch lumber may be kiln-dried on the same schedule as western redcedar, with an estimated drying time of 4-1/2 to 6 days to achieve 7 percent moisture content. For 2-inch lumber a drying time of 5 to 7 days is needed to achieve 8 percent moisture content. When properly dried the wood stays in place well and has little tendency to shrink or swell. Some longitudinal shrinkage may occur if compression wood[2] is present; although kiln-drying helps relieve stresses, it will not completely eliminate them. Careful selection to avoid compression wood is recommended for long, narrow stock.

Alaska-cedar is extremely durable. The heartwood is reputed to resist attack by marine borers. The wood has been used in ship construction for a long time, and records show that after 15 years of service under severe conditions, Alaska-cedar remained sound when other timbers had to be replaced. The wood has been used in Japan for temples because of its resistance to termites.

The secret to the great durability of Alaska-cedar is in the chemistry of the heartwood. Among the many chemical compounds that have been extracted, nootkatin, a tropolene, inhibits fungal growth at concentrations of 0.001 to 0.002 percent. Durability is affected by heating; when the wood is heated for 1 hour at 149° C (300° F), its durability may be lowered by 25 percent. Certain black-stain fungi are capable of degrading nootkatin, thereby increasing the susceptibility of the heartwood to subsequent decay. Trees often attain great age, and heart-rotting fungi cause considerable defect in older trees.

Because of its natural durability, the wood is seldom treated with preservatives, and little information is available on their use. Tests indicate it is difficult to penetrate the wood with preservatives because of its high natural oil content.

[2] Compression wood is found in zones on the lower side of inclined trunks and branches. It is often darker in color and has a smoother appearance than the surrounding wood. The growth rings, which are wider than elsewhere, lack contrast between the early wood and latewood, and appear to be made up mostly of denser latewood. Compression wood exhibits high longitudinal shrinkage and is lower in practially all strength properties than normal wood.

Alaska-cedar is in the top category of woods on which paints adhere well, when applied correctly, and give good service. In Alaska, however, some trouble with paint holding on boats has been reported, possibly because the wet climate makes it difficult to dry the wood before painting. The natural oil prevents the wood from absorbing oil-based paints readily, and the surface must be well prepared before painting, especially after kiln-drying. Where good paint and varnish adhesion is essential, as on boats, surfaces may be heated and dried with a blowtorch, then primed with red lead before applying the final coats. Another method is to expose surfaces to the weather as long as convenient, then prime with paint or varnish heavily diluted with pure turpentine. More drying time is needed after painting than with most other softwoods.

Alaska-cedar has good insulating properties and is more resistant to fire than some species. In tests where 1-5/8-inch-thick roof decking was subjected to a gas flame, the average times for flame to burn through were 22 minutes for western redcedar, 26 minutes for Douglas-fir, and 44 minutes for Alaska-cedar.

Principal Uses

Because of its durability, resistance to acid, smooth-wearing quality, stability, and workability, Alaska-cedar has a wide variety of uses. Its value in shipbuilding has long been recognized. Indians of the northwest coast of North America carved canoes from it, and Russian colonists of Alaska used it in constructing the hulls of some 20 steamers built at their Sitka shipyards between 1840 and 1863. The wood is now used for canoes, racing shells, skiffs, fishing boats, tugs, scows, barges, and yachts.

It is also used for outdoor items such as signs, garden furniture, greenhouses, window frames and screens, window boxes, stadium seats, power poles, and

marine piling. Industrial uses include water tanks, cooling towers, acid-storage tanks, vats, chemical containers, benches, walks, and other uses where contact with acid is likely.

Alaska-cedar is used where severe exposure to weather, heavy traffic, and shock loads are encountered, such as for heavy flooring, bridge and dock decking, and bedding for heavy machinery. Other construction uses include framing, roof decking, exposed beams and posts, and concrete forms.

Indoors it is used for molding, sashes, doors, furniture, cabinets, shelving, paneling, and flooring. It is also used for canoe paddles, patterns, veneer cores, toys, and musical instruments.

Alaska-cedar has been used as lining for closets and boxes to repel moths. In fact, in the 19th century it was prized in China where it was imported and made into trunks and chests under the name of "camphor wood."

The wood was used in many ways by the northwest Indians of British Columbia and Alaska—for canoes, canoe paddles, totem poles, fishhooks, masks, hats, and rattles. The bark was used in basketry, twisted into string or rope, and mixed with mountain goat wool to be woven into blankets.

References

Arno, Stephen F. Interpreting the timberline: an aid to help park naturalists to acquaint visitors with the subalpine-alpine ecotone of western North America. San Francisco, CA: U.S. Department of the Interior, National Park Service, Western Regional Office; 1967. 206 p.

Barton, G.M. A review of yellow cedar (*Chamaecyparis nootkatensis* (D. Don) Spach) extractives and their importance to utilization. Wood and Fiber 8(3): 172–176; 1976.

Bender, F. Cedar leaf oils. Dep. For. Publ. 1008. Ottawa, ON: Canada Department of Forestry, Forest Products Research Branch; 1963. 16 p.

British Columbia Forest Service. Forest inventory statistics of British Columbia, 1967. Victoria, BC: British Columbia Forest Service, Department of Lands, Forests and Waters; 1969. 194 p.

Earl, Derek. Yellow cedar (*Chamaecyparis nootkatensis* (D. Don) Spach). Q.J. For. 52(3): 204–207; 1958.

England, R.F.; Stahl, E. Marine laminating properties of selected wood species: outdoor exposure—Alaska yellow-cedar *(Chamaecyparis nootkatensis)*, western larch *(Larix occidentalis)*. BuShips, Index No. SR007-03-02, Indent. No. 37-1004-2, Prog. Rep. E-412-L3. Bremerton, WA: Puget Sound Naval Shipyard; 1963. 5 p.

Fitzpatrick, H.M. Conifers: keys to the genera and species, with economic notes. R. Dublin Soc. Sci. Proc. Series A 2(7): 67–129; 1965.

Fowells, H.A., comp. Silvics of forest trees of the United States. Agric. Handb. 271. Washington, DC: U.S. Department of Agriculture; 1965. 762 p.

Franklin, Jerry F.; Trappe, James M. Plant communities of the northern Cascade Range: a reconnaissance. Northwest Sci. 37(4): 163–164; 1963.

Frenkel, Robert E. An isolated occurrence of Alaska-cedar *(Chamaecyparis nootkatensis* (D. Don) Spach) in the Aldrich Mountains, central Oregon. Northwest Sci. 48(1): 29–37; 1974.

Harris, A.S. Alaska-cedar, a bibliography with abstracts. Res. Pap. PNW-73. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1969. 47 p.

Hartman, Kay. National register of big trees. Am. For. 88(4): 17–31, 34–48; 1982.

Hepting, George H. Diseases of forest and shade trees of the United States. Agric. Handb. 386. Washington, DC: U.S. Department of Agriculture; 1971. 658 p.

Little, Elbert L., Jr. Checklist of United States trees (native and naturalized). Agric. Handb. 541. Washington, DC: U.S. Department of Agriculture; 1979. 375 p.

Perry, R.S. Yellow-cedar: its characteristics, properties, and uses. Bull. 114. Ottowa, ON: Canada Department of Northern Affairs and National Resources, Forestry Branch; 1954. 19 p.

Rennerfelt, Erik; Nacht, Gertrud. The fungicidal activity of some constituents from heartwood of conifers. Sven. Bot. Tidskr. 49(3): 419–432; 1955.

Resch, Helmuth; Ecklund, Barton A. Moisture content determination for wood with highly volatile constituents. For. Prod. J. 13(11): 481–482; 1963.

Scheffer, T.C.; Eslyn, W.E. Effect of heat on the decay resistance of wood. For. Prod. J. 11(10): 485–490; 1961.

Smith, Roger S.; Cserjesi, A.J. Degradation of nootkatin by fungi causing black heartwood stain in yellow cedar. Can. J. Bot. 48(10): 1727–1729; 1970.

U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. Wood handbook: wood as an engineering material. Agric. Handb. 72. Rev. ed. Washington, DC: U.S. Department of Agriculture; 1974. 428 p.

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